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6

Attitudes and attitude change among zoo visitors

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INTRODUCTION

The primary mission of zoos increasingly focuses on conservation and conservation education (Rhoads and Goldsworthy 1979, Altman 1998, Morgan and Hodgkinson 1999, Conway 2000, Swanagan 2000, Hutchins *et al.* 2003, Miller *et al.* 2004). To promote conservation effectively, we argue that zoos must do much more than simply provide information to visitors; they must help engender positive values and attitudes toward nature. Many zoos attempt just that. Unfortunately, little research has evaluated whether zoos are successful in those efforts (Rhoads and Goldsworthy 1979). Yet, many zoos alter exhibits, develop education programs, and create new graphics with the goal of increasing support for nature conservation. We encourage further research to evaluate the efficacy of these new directions and programs.

Toward that end, we initiated a study into the attitudes of visitors to the Denver Zoo. We view this study as a first step in evaluating how well our zoo addresses its conservation education mandate. We asked visitors to the Denver Zoo questions about their views on zoos in general, their reasons for visiting the zoo, and their attitudes toward the relationship between people and nature. We also asked questions to visitors about a specific conservation topic of interest to people in Colorado, namely attitudes towards gray wolves (*Canis lupus*) and wolf restoration in the state. We chose wolf restoration because it is a timely and controversial conservation topic in Colorado, especially given the recent restoration efforts to the north (Wyoming, Idaho, and Montana) and south (Arizona and New Mexico) of the state, and because

we were also studying attitudes toward this topic among the general public (Meadow *et al.* 2005). We discuss our results with respect to future directions for zoos in social science research.

Values, attitudes, and knowledge

Terms such as values, attitudes, and knowledge are often used inconsistently by people outside of the social sciences. Even social scientists may define these terms differently. It is therefore important that we define our terms.

A *value* is a preferred mode of behaving (e.g., honesty) or existing (e.g., equality). Numerous values exist and social scientists classify them in various ways (e.g., Lasswell 1971, Steinhoff 1980, Kellert 1996). People possess multiple values, even on a single topic, that vary in strength and are ordered hierarchically (Rokeach 1972, Brown 1984). When values clash people usually rely upon more strongly held values (core values) over less strongly held ones (peripheral values) (Williams 1979). Thus, two people can share a common value, but still come into conflict on a relevant issue if the strength of that value varies (especially relative to other values). Values influence and are affected by attitudes, contextual factors, and knowledge (Rokeach 1972, Williams 1979, Brown 1984, Brown and Manfredo 1987).

Attitudes are affinities or aversions toward an issue or entity based on beliefs, or what a person senses and understands about how that issue or entity affects a given situation (Bem 1970, Rokeach 1972, Brown 1984). Extreme attitudes tend to be based on more simple belief systems than moderate attitudes (Bright and Barro 2000).

Context describes a person's situation; for example, frequency of exposure to an issue, customs, peer pressure, socialization by institutions, mood, and physical state (e.g., health) (Brown and Manfredo 1987, Chaiken and Stangor 1987).

Knowledge is the acquisition, comprehension, and retention of information and it depends on exposure, receptivity, perception, interpretation, and memory (Petty *et al.* 1997). Knowledge is only one of several factors influencing values and attitudes, and its influence is often relatively weak. Yet the importance of knowledge is often overestimated, especially among people who value knowledge greatly, such as educators and conservationists (Reading 1993, Kellert *et al.* 1996). When values and attitudes are strongly held, new knowledge is often selectively received and interpreted (Tessler and Shaffer 1990, Olson and Zanna 1993). In part, this results because people focus on and more easily memorize and recall information that supports existing values and attitudes. These interactions are strengthened if

information is poor, ambiguous, or too complex to be easily understood (Tessler and Shaffer 1990, Olson and Zanna 1993).

Changing values, attitudes, and associated behaviors is difficult and education programs directed at doing so are rarely successful, especially when values and attitudes are strongly held (Chaiken and Stangor 1987). Providing information is important, but since knowledge is only one of several factors influencing attitudes, changing the attitudes of people with strongly held values and attitudes is difficult or impossible. Indeed, for both wolves (Bath 1989, Kellert 1990) and black-footed ferrets (*Mustela nigripes*) (Reading and Kellert 1993), the two groups of people that scored highest on knowledge of the species were ranchers and conservationists. Yet, those two groups had diametrically opposed attitudes about those species.

Values, attitudes, and behaviors can and do change over time as situations, knowledge, and experiences change (Sinden and Worrel 1979, Williams 1979). Understanding why and how values, attitudes, and behaviors change is important if zoos hope to develop more supportive publics for conservation. Inducing such change usually requires more than simply providing information. Most social scientists agree that the best chances for attitude change occur when individuals become aware of internal contradictions between different values, or between values, attitudes, and behaviors (Williams 1979, Olson and Zanna 1993, Petty *et al.* 1997). For example antilittering campaigns often succeed by playing on people's patriotism and love of nature. People will seek to reduce the discomfort they experience from these inconsistencies by changing more dissonant, peripheral values and attitudes and behaviors to better reflect core values (Williams 1979, Tessler and Shaffer 1990).

Persuading people to make such changes requires that they both receive and acquiesce to a persuasive message (Olson and Zanna 1993). Receptivity depends on several factors, including motivation, the identity of the messenger, cultural congruence of the message and receiver, the strength and frequency of the message, the clarity of the message, and the state of the recipient (Chaiken and Stangor 1987, Petty *et al.* 1997). Peer pressure can play a large role in maintaining or changing values, attitudes, and behaviors (Chaiken and Stangor 1987, Tessler and Shaffer 1990). In addition, changes are more likely to occur when alternative choices are provided that facilitate attitude or behavior change or permit people to reach the same or similar goals differently (Tessler and Shaffer 1990, Petty *et al.* 1997). For example, people are more likely to throw trash into a garbage can than on to the street when such containers are made easily available. Another effective way to change attitudes is through the social institutions that form and reinforce

values (Reading 1993). All major social institutions are important, but education and religious institutions may be the most influential (Reading 1993). When a value is strongly intertwined with other values, or is the product of personal experience, it is more difficult to change (Williams 1979, Olson and Zanna 1993).

Some people argue that we should not try to influence other people's values and attitudes. Usually these people disagree with the value or attitude being promoted and strive to make it seem as though they are "taking the moral high ground." In reality, such a stance promotes the status quo. While we should respect the right of people to hold different values and attitudes, we should also recognize that since everyone believes their value system is superior (otherwise they would change it), people constantly strive to influence the values and attitudes of others.

Zoos, education, and attitude change

All zoos accredited by the Association of Zoos and Aquariums (AZA) support active education programs. AZA-affiliated zoos host millions of visitors every year (over 135 million in 2002) and are considered one of the most trusted sources of information about nature by the general public (Hutchins *et al.* 2003). As such, zoos have vast potential to educate people and promote positive attitudes toward animals and nature. Yet critics argue that zoos are not educating people (Swanagan 2000).

One of the greatest challenges to zoo education programs is that visitors come to zoos largely to be entertained or for family outings, not for educational experiences (Andereck and Caldwell 1994, Tunnicliffe 1996, Acampora 1998, Morgan and Hodgkinson 1999). However, visitors, especially parents with children, often cite education as a secondary goal of zoo visits (Kidd *et al.* 1995, Morgan and Hodgkinson 1999). Thus, one of the challenges for zoos is to develop education programs that will appeal to and reach visitors who may have little incentive to learn.

We suggest that if zoos are serious about being conservation education organizations, a second challenge of their education programs is to not only provide information, but also to develop positive values and attitudes toward animals and wildlife conservation. Furthermore, the acquired information and values should empower people to act. Unfortunately, many education programs fall far short of these goals, and instead offer chatty newsletters and arcane information. These problems can occur when a zoo (or any type of organization) lacks specific goals for their programs (Masci 2000), embraces self-promotion as the primary goal, or strives for political neutrality. Because people arrange values and associated goals hierarchically,

strong self-promotion, legitimacy, power, or other goals can subvert education goals (Clark 1997). Claiming institutional neutrality supports existing policies and actions or inactions that often damage nature (see Miller *et al.* 2004).

Zoos spend millions of dollars on education programs, informative signs, and improved exhibits in efforts to improve their educational impact. Unfortunately, the vast majority of these efforts go unevaluated (Kidd *et al.* 1995). Much of the evaluation that has occurred is not encouraging. For example, Altman (1998) reviews research demonstrating that visitors rarely even read zoo signs, let alone retain the information on them. Dunlap and Kellert (1989) found that people demonstrated little increase in knowledge about animals after zoo visits. Instead, most people appear to visit zoos for recreation, primarily as family or group outings, and appear little interested in education (Tunnicliffe 1996, Acampora 1998, Morgan and Hodgkinson 1999).

Alternatively, more active education programs apparently have had more success (Kidd *et al.* 1995, Altman 1998, Hutchins *et al.* 2003) and a minority, but still large percentage, of zoo visitors have cited education as a secondary goal of their trip (Morgan and Hodgkinson 1999). Morgan and Hodgkinson (1999) call for blending education programs with enjoyable, recreational activities. Heinrich and Birney (1992) found that it was possible to impart information to visitors while entertaining them. They found that spectators of animal demonstrations received and retained much of the information provided for 6 days. Similarly, research by Kidd *et al.* (1995) indicated that petting zoos created more possibilities for learning and more favorable attitudes toward animals among small children. Altman (1998) studied the impact of animal activity on learning and found that non-stereotypic activity increases an exhibit's holding power and facilitates learning. She suggests using enrichment to both improve animal welfare and increase the chances for effective education. Hutchins *et al.* (2003) provide additional examples of effective education, at least in the short-term. Despite these apparent successes, zoo education programs could be greatly improved.

Beyond the apparent limited ability of most zoo education programs to impart information, critics argue that zoos demonstrate human mastery over wildlife, symbolize humanity's dominion over nature, and anthropomorphize animals (Marvin 1994, Acampora 1998, Swanagan 2000). Of course, even with successful education programs, people may acquire information, but still not develop more favorable values and attitudes because of the differences between knowledge, values, and attitudes described above.

Exhibit designs also likely influence values and attitudes toward animals and conservation through contextual effects. In a study by Rhoads and Goldsworthy (1979), subjects rated zoo animals in significantly more negative terms than animals in natural or semi-natural settings. Studies summarized by Swanagan (2000) found that exhibit design was important. Interest in conservation increased among visitors to more naturalistic exhibits that included an educational focus.

Research more specifically directed at values and attitudes found that zoo visits reinforce or increase people's sense of superiority over nature (Tunnicliffe 1996, Kellert 1996, 1997). And, visitors often anthropomorphize animals, stating that they are funny, ugly, disgusting, cute, ferocious, etc. (Marvin 1994, Tunnicliffe 1996). These results are particularly disturbing and point to the serious need for zoos to address how and if they influence visitors' values and attitudes. This is an area ripe for additional research and, we argue, crucially pertinent to the missions of most zoos.

METHODS

We surveyed visitors to the Denver Zoo on 45 days in 1998, 2000, and 2001. We conducted the survey in conjunction with a marketing firm (Data Marketing Associates, Inc., Phoenix, AZ) that was collecting data on potential clients. Respondents self-selected themselves to complete the survey, which we located at a well-marked kiosk on zoo grounds. We offered respondents a chance to win an automobile as an incentive for completing the survey.

The survey asked respondents seven demographic questions, three questions about leisure activities, if respondents were members of the Denver Zoo, how often the respondents visit the Denver Zoo, a description of the group that was visiting (if applicable), why they visited the zoo, what they thought about zoos in general, and how they believe that people are related to animals and nature. Surveys administered in 2001 also asked three questions about wolves: (1) the level of threat they thought wolves posed to agriculture, (2) the role they felt wolves play in maintaining ecosystem health, and (3) if they would like to see wolves restored to wilderness areas in Colorado. Specific questions and a copy of the survey instrument are available upon request.

We examined all variables for normality and checked for homogeneity of group variance using Barlett's test. We compared pair means using simple *t*-tests. Count response data were compared using Pearson's likelihood ratio chi-square tests and Yate's corrected X^2 for 2 × 2 comparisons. Unless otherwise indicated, all means presented ± 1 S.D. We set significance at $P < 0.05$.

To assess non-response bias, we surveyed 890 people who did not complete the survey as they exited the zoo on 4 and 5 May 1998. Of these 785 surveys were usable. Comparing groups, we found no difference in age ($t = -0.15$, df = 20 606, $P = 0.88$), race ($X^2 = 1.40$, df = 4, $P = 0.85$), membership status (Yate's $X^2 = 0.00$, df = 1, $P = 0.98$), or visitation rate ($X^2 = 4.55$, df = 3, $P = 0.21$) among respondents and non-respondents. However, non-respondents were significantly more likely to be married (Yate's $X^2 = 7.34$, df = 1, $P < 0.01$), female (Yate's $X^2 = 16.96$, df = 1, $P < 0.001$), and better educated ($X^2 = 11.82$, df = 3, $P < 0.01$) than respondents. Nevertheless, overall, we found no significant differences in responses among respondents and non-respondents to the questions on why they visited the zoo ($X^2 = 4.75$, df = 6, $P = 0.58$); what they thought about zoos in general ($X^2 = 1.01$, df = 3, $P = 0.80$); and how they believe that people are related to animals and nature ($X^2 = 6.29$, df = 5, $P = 0.28$), suggesting that non-response bias was weak.

RESULTS

We received 22 028 usable surveys (hundreds of surveys were excluded from analyses for a variety of reasons, such as missing information or failure to follow instructions). Given the large sample size, most of our analyses yielded statistically significant results. Still, just because a result is statistically significant does not mean that the difference is meaningful from a social science or management perspective. Therefore, in most cases, it is more important to look at the magnitude of the difference between respondents than whether or not that difference is statistically significant.

When asked how respondents felt about zoos in general, most (55.1%) responded that they are important for education (Figure 6.1). Almost half (49.1%) also believed that zoos are important for conserving wildlife (note that respondents often chose more than one response, so percentages add to over 100%). A smaller percentage (39.3%) felt that zoos were nice places to visit. These results contrast with the reasons people gave for why they visited the zoo. The majority of respondents (56.5%) indicated that the main reason they visited the zoo was for a family outing, followed by their desire to see animals (26.9%). Only 18.4% of respondents stated that they visited the zoo to learn about animals or wildlife conservation. Other main reasons for visiting the zoo were to do something outdoors (17.7%) or for mental relaxation (12.6%).

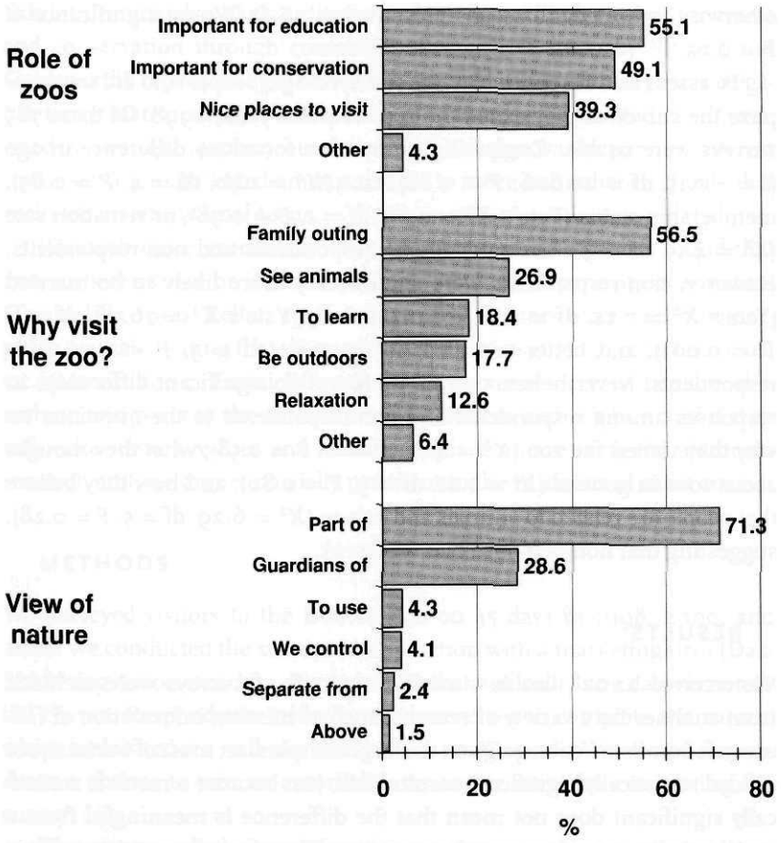

Figure 6.1 Attitudes of Denver Zoo visitors on the role of zoos, why they visit the zoo, and the relationship between people and nature

A third question asked respondents how they felt people are related to animals and nature (Figure 6.1). The vast majority of zoo visitors responded that people are a part of nature (71.3%), while 28.6% stated that people are guardians of nature. Few visitors indicated other, more dominionistic or negativistic relationships, such as nature exists for people to use (4.3%), people control nature (4.1%), people are fundamentally separate from nature (2.4%), or people are above nature (1.5%).

Attitudes toward wolves

We also asked a sub-sample of respondents three questions that addressed a more specific conservation issue that has relevance in Colorado. These

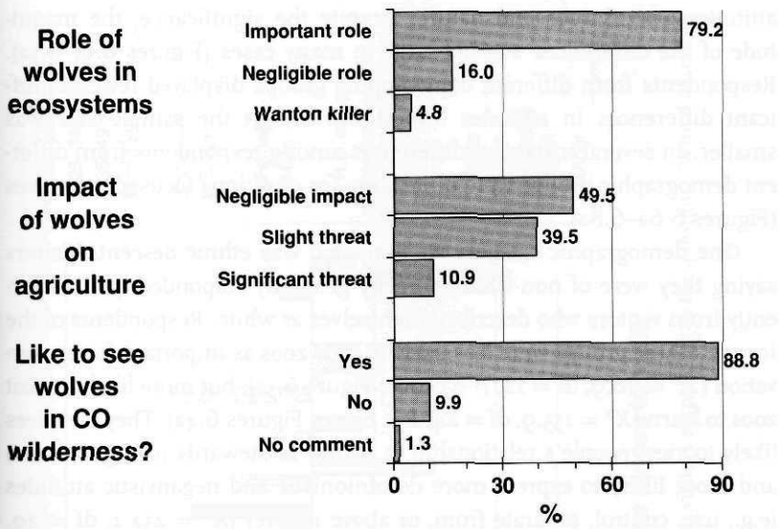

Figure 6.2 Attitudes of Denver Zoo visitors toward the role of wolves (*Canis lupus*) in ecosystems, the likely impact of wolves on agriculture, and possible wolf restoration into Colorado's wilderness areas

questions focused on attitudes toward wolves and possible wolf restoration in Colorado. We received 4237 responses to questions on wolves.

We first asked visitors about the role that wolves play in maintaining healthy ecosystems. A large majority of respondents believed that they play an important role (Figure 6.2). Only 16% of visitors thought wolves play a negligible role in maintaining ecosystem health and 4.8% felt that wolves are wanton killers of deer and elk. When asked about wolves' impacts on the agricultural economy of Colorado, just under half (49.5%) of respondents indicated that they thought wolves pose a negligible threat. Over a third (39.5%) thought that wolves would represent a slight threat to agriculture that would be somehow mitigated or compensated. Few respondents (10.9%) believed that wolves would significantly threaten Colorado's agricultural economy. Lastly, we asked if respondents would like to see wolves living in the wilderness areas of Colorado. The vast majority (88.8%) of visitors indicated that they would like to see wolves in Colorado's wilderness areas, while only 9.9% opposed the idea.

Demographic variation

We found significant variation among different demographic groups for almost all categories we analyzed for our questions that explored general

attitudes toward zoos and nature. Despite the significance, the magnitude of the differences was not large in many cases (Figures 6.3a–6.5a). Respondents from different demographic groups displayed fewer significant differences in attitudes toward wolves, yet the sample size was smaller. In several instances, differences among respondents from different demographic groups were quite large for questions focused on wolves (Figures 6.6a–6.8a).

One demographic category we evaluated was ethnic descent. Visitors saying they were of non-white ethnicity generally responded quite differently from visitors who described themselves as white. Respondents of the former ethnic groups were less likely to view zoos as important for conservation ($X^2 = 70.9$, df = 12, $P < 0.001$; Figure 6.3a), but more likely to visit zoos to learn ($X^2 = 153.9$, df = 24, $P < 0.001$; Figures 6.4a). They were less likely to view people's relationship to nature as stewards (i.e., guardians) and more likely to express more dominionistic and negativistic attitudes (e.g., use, control, separate from, or above nature) ($X^2 = 232.2$, df = 20, $P < 0.001$; Figure 6.5a). With respect to wolves, black, Hispanic, Asian, and other non-white respondents were significantly more likely than white respondents to view wolves as wanton killers that play a negligible role in maintaining ecosystem health ($X^2 = 101.5$, df = 8, $P < 0.001$; Figure 6.6a) and as a species that poses a significant threat to Colorado's agricultural economy ($X^2 = 112.8$, df = 8, $P < 0.001$; Figure 6.7a). As such, non-white visitors were significantly more likely to oppose establishing a population of wolves in Colorado ($X^2 = 76.2$, df = 8, $P < 0.001$; Figure 6.8a).

Respondents less than 25 years old were less likely to view zoos as important for education, while respondents over 49 years old were more likely to indicate that zoos are important for conservation ($X^2 = 96.5$, df = 9, $P < 0.001$; Figure 6.3a). Perhaps not surprisingly, respondents under 25 and unmarried were less likely to visit zoos for family outings; instead visiting to see animals or be outdoors ($X^2 = 599.9$, df = 18, $P < 0.001$ and $X^2 = 1109.4$, df = 6, $P < 0.001$, respectively; Figure 6.4a). Younger, single visitors were more likely to view people as part of nature, while older, married visitors were more likely to view people as guardians of nature ($X^2 = 255.9$, df = 15, $P < 0.001$ and $X^2 = 123.9$, df = 5, $P < 0.001$, respectively; Figure 6.5a).

Respondents with fewer years of formal education generally thought zoos were more important for conservation and were nice places to visit than did respondents with more education ($X^2 = 63.0$, df = 9, $P < 0.001$; Figure 6.3a). Visitors with less education visited zoos more to see animals and to learn ($X^2 = 153.3$, df = 18, $P < 0.001$; Figure 6.4a) and expressed

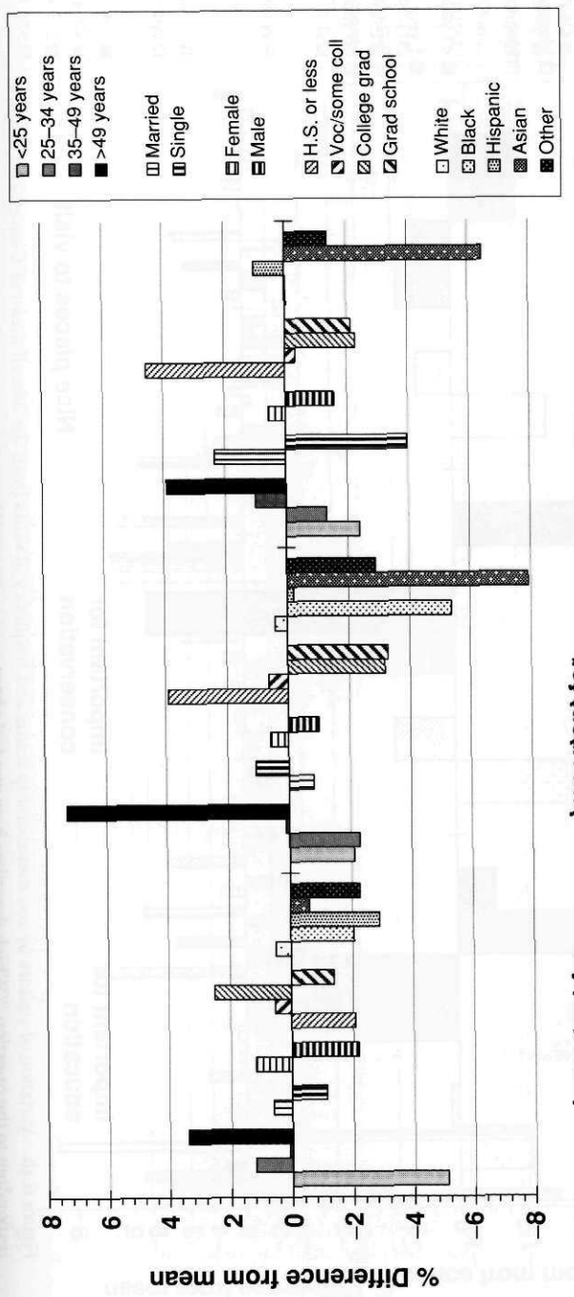

Figure 6.3a Variation of demographic groups from the overall mean of Denver Zoo visitors responding to the question, "Which describes how you feel about zoos in general?"
Note: People often used multiple responses

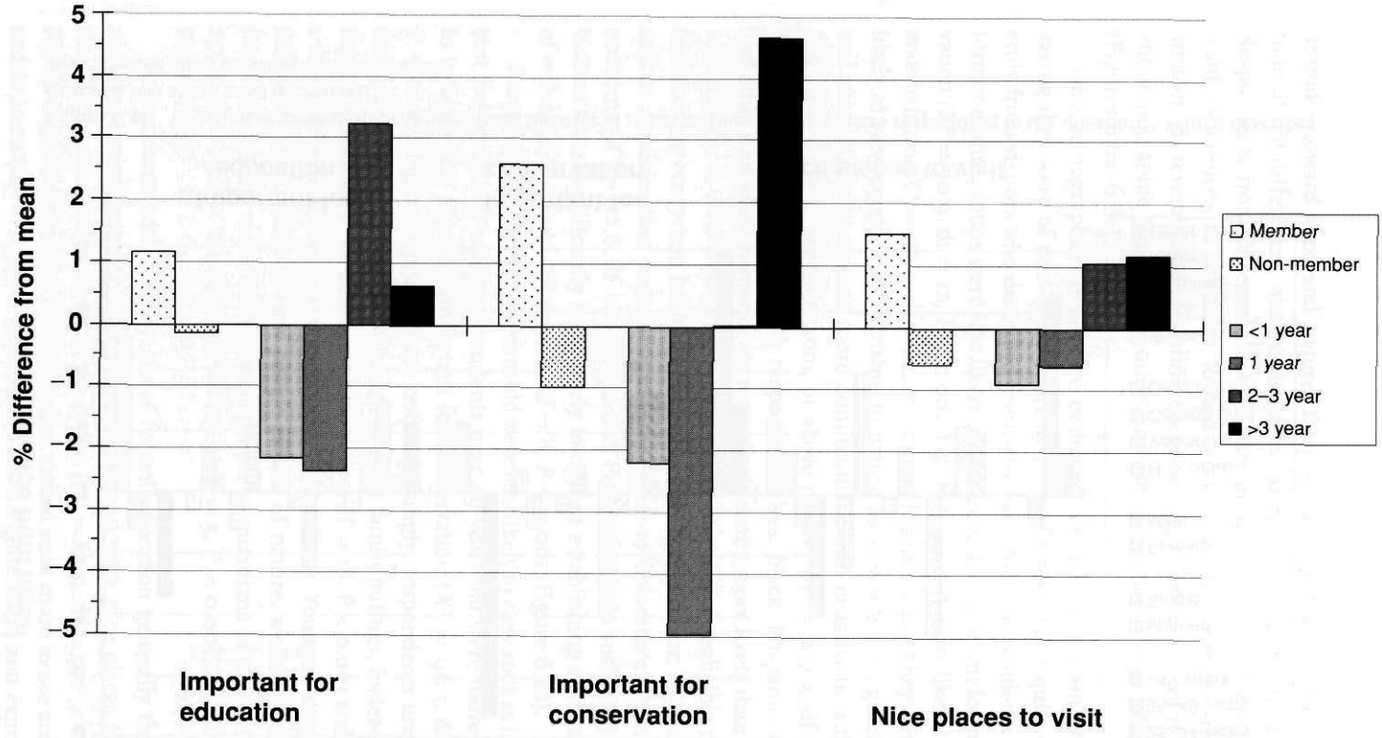

Figure 6.3b Variation of visitors by zoo membership status and frequency of visits from the overall mean of Denver Zoo visitors responding to the question, "Which describes how you feel about zoos in general?"
Note: People often used multiple responses

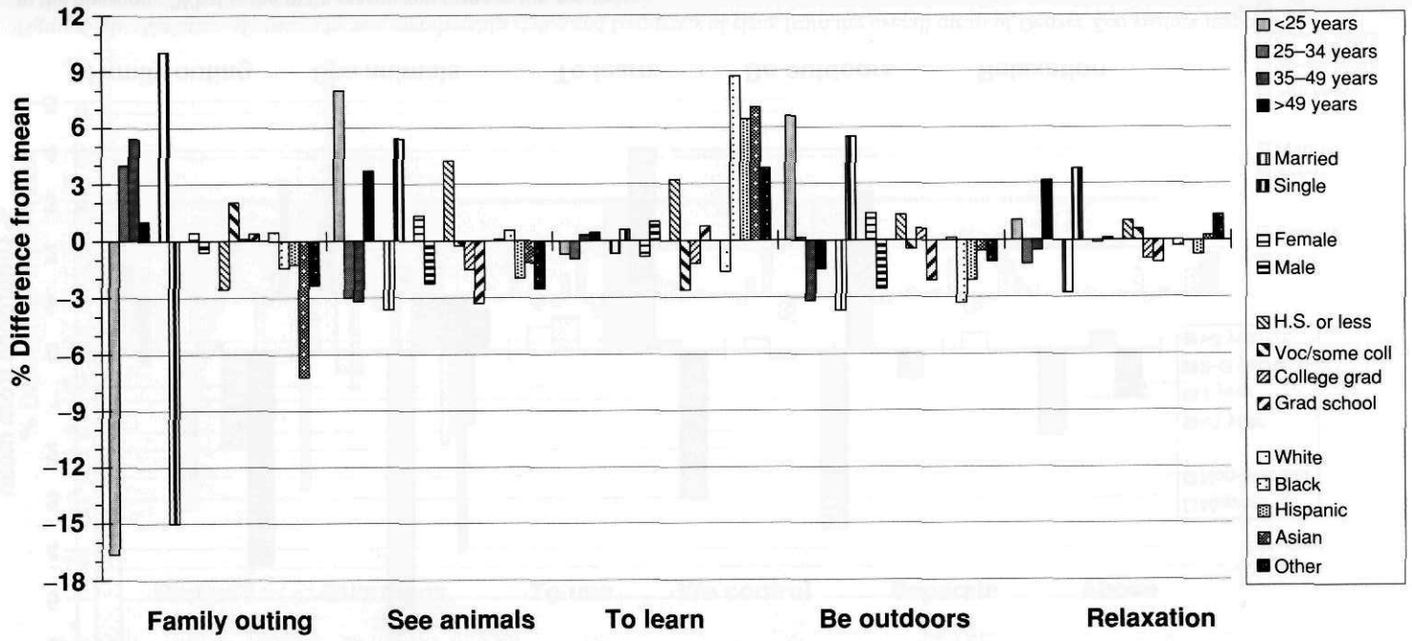

Figure 6.4a Variation of demographic groups from the overall mean of Denver Zoo visitors responding to the question, "What is the main reason you came to the zoo today?"
Note: People often used multiple responses

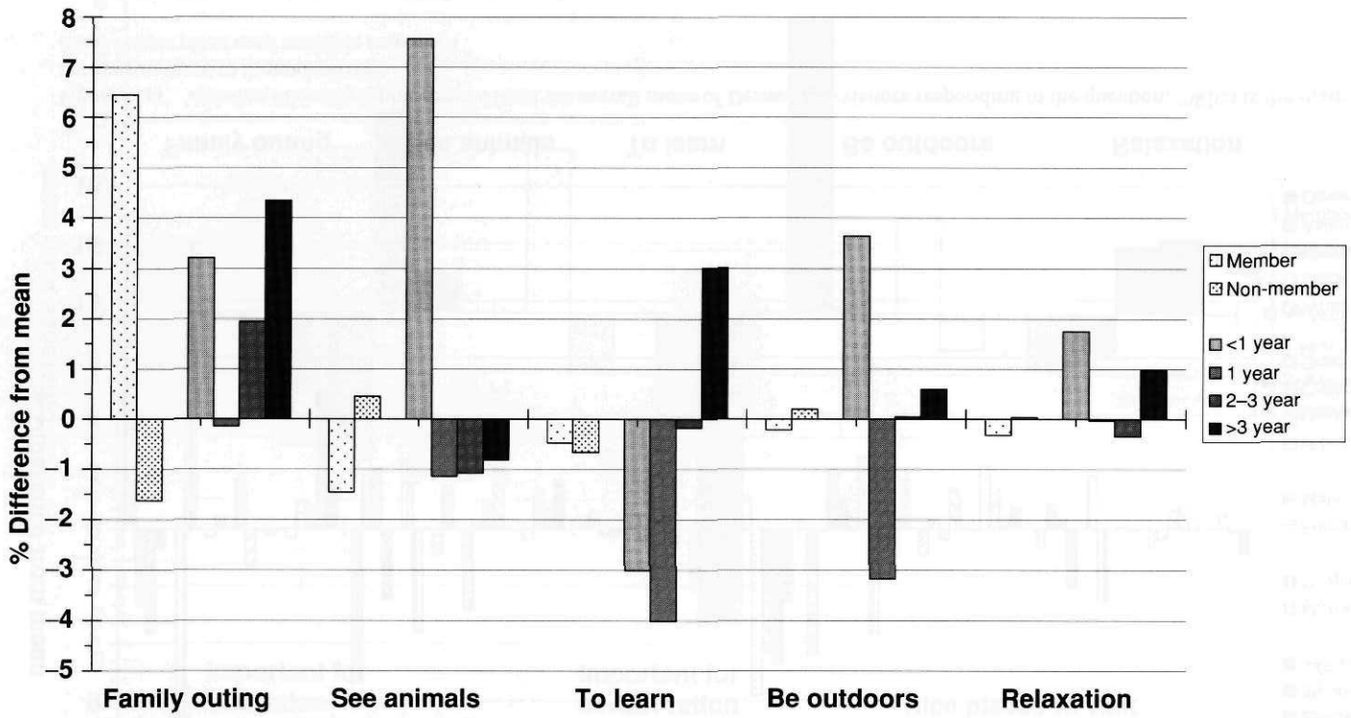

Figure 6.4b Variation of visitors by zoo membership status and frequency of visits from the overall mean of Denver Zoo visitors responding to the question, "What is the main reason you came to the zoo today?"
Note: People often used multiple responses

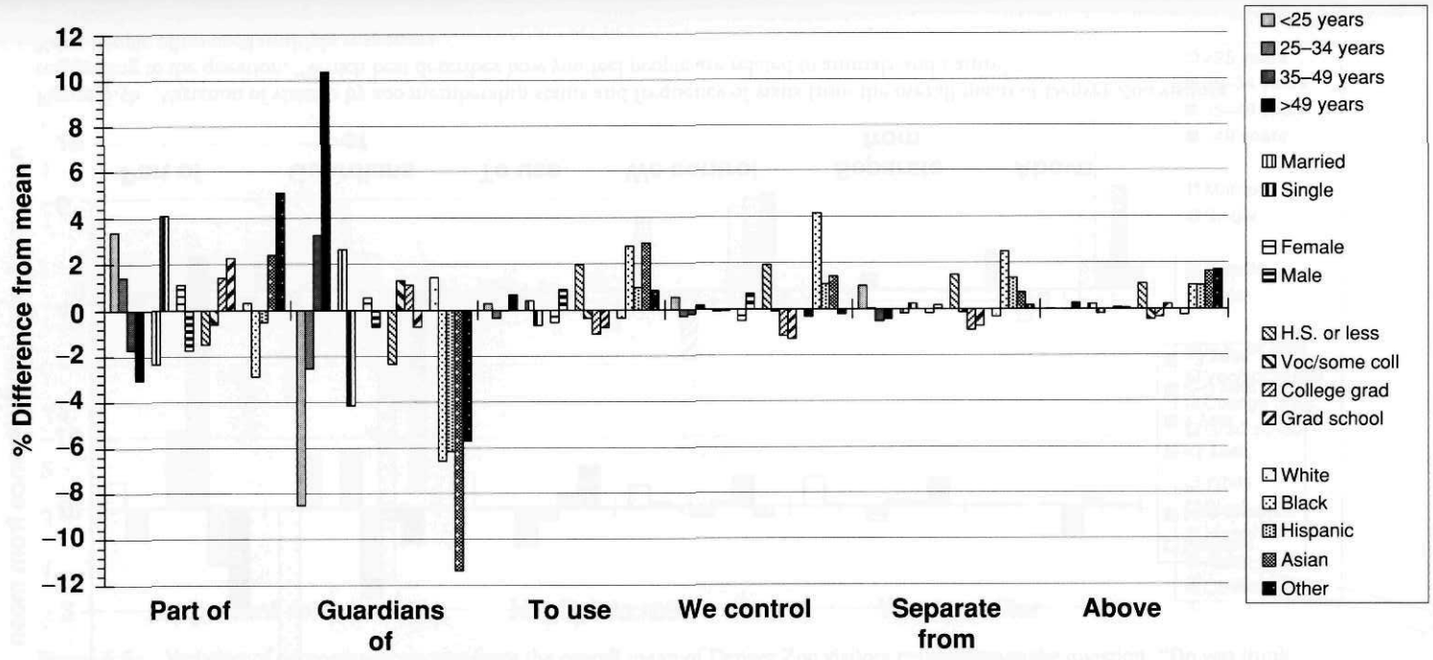

Figure 6.5a Variation of demographic groups from the overall mean of Denver Zoo visitors responding to the question, "Which best describes how you feel people are related to animals and nature?"
Note: People often used multiple responses

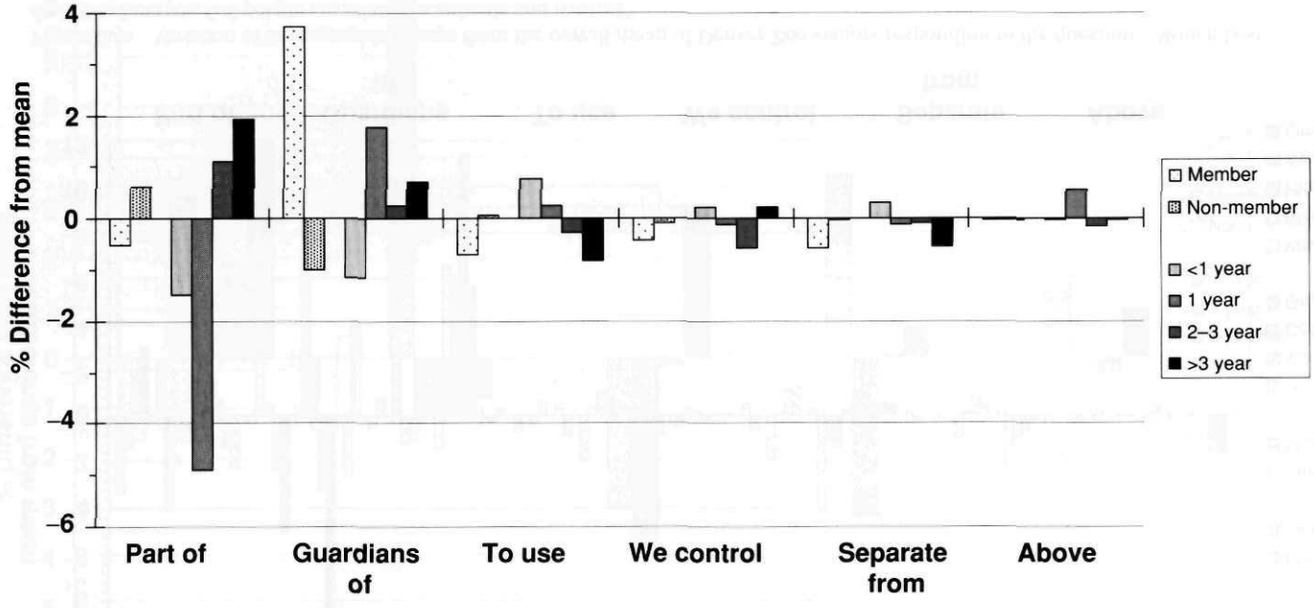

Figure 6.5b Variation of visitors by zoo membership status and frequency of visits from the overall mean of Denver Zoo visitors responding to the question, "Which best describes how you feel people are related to animals and nature?"
Note: People often used multiple responses

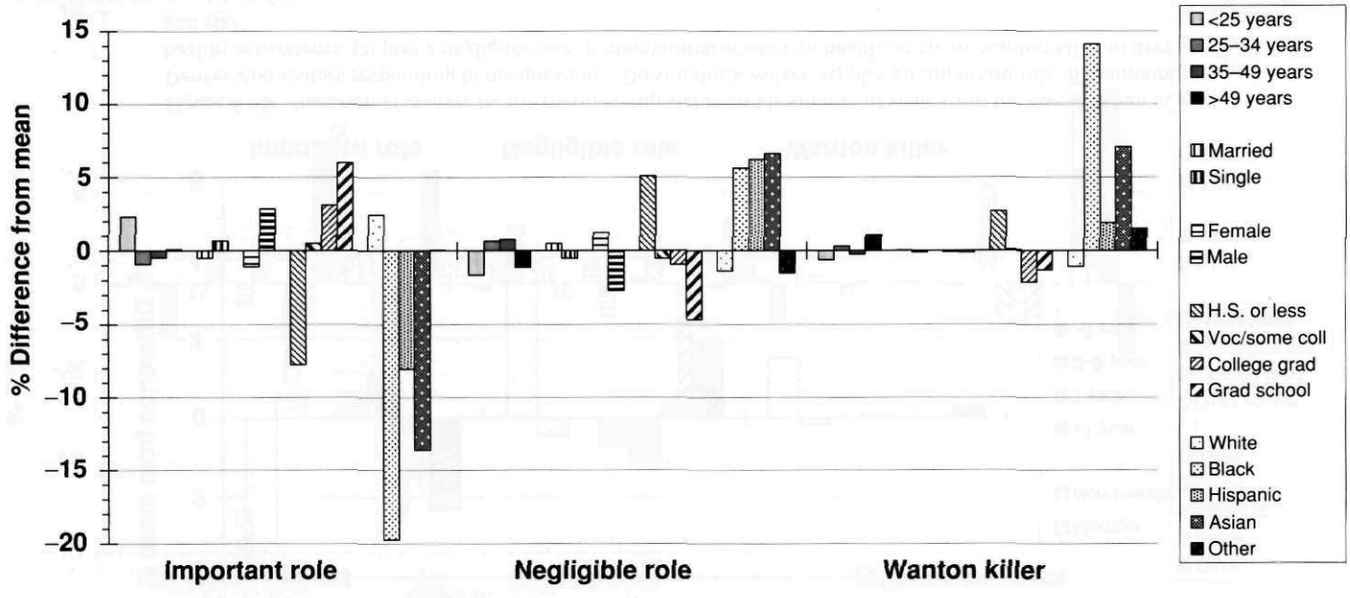

Figure 6.6a Variation of demographic groups from the overall mean of Denver Zoo visitors responding to the question, "Do you think wolves: (1) play an important role in maintaining healthy ecosystems; (2) play a negligible role in maintaining ecosystem health; or (3) are wanton killer of deer and elk?"

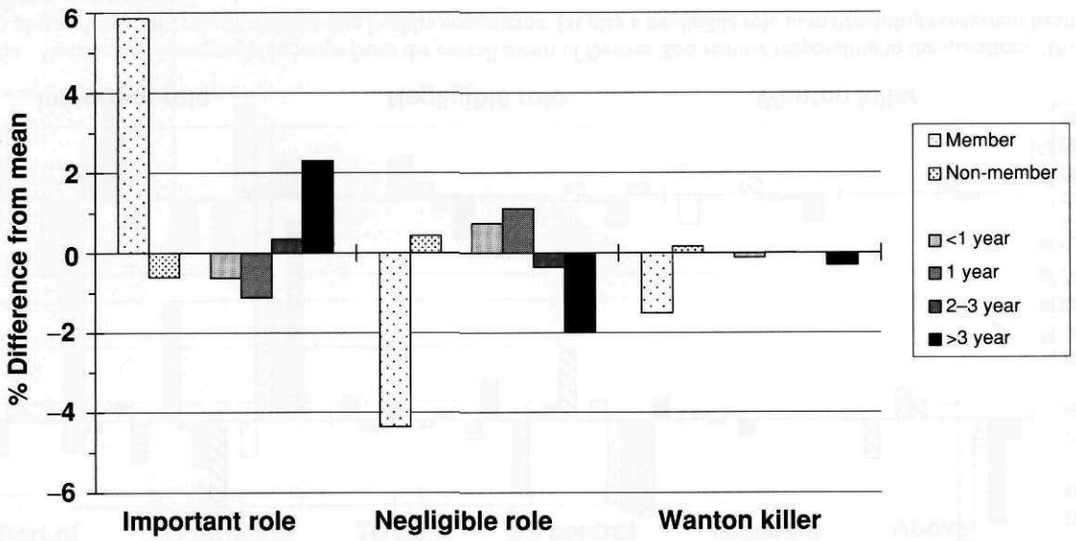

Figure 6.6b Variation of visitors by zoo membership status and frequency of visits from the overall mean of Denver Zoo visitors responding to the question, *"Do you think wolves: (1) play an important role in maintaining* healthy ecosystems; (2) play a negligible role in maintaining ecosystem health; or (3) are wanton killer of deer and elk?"

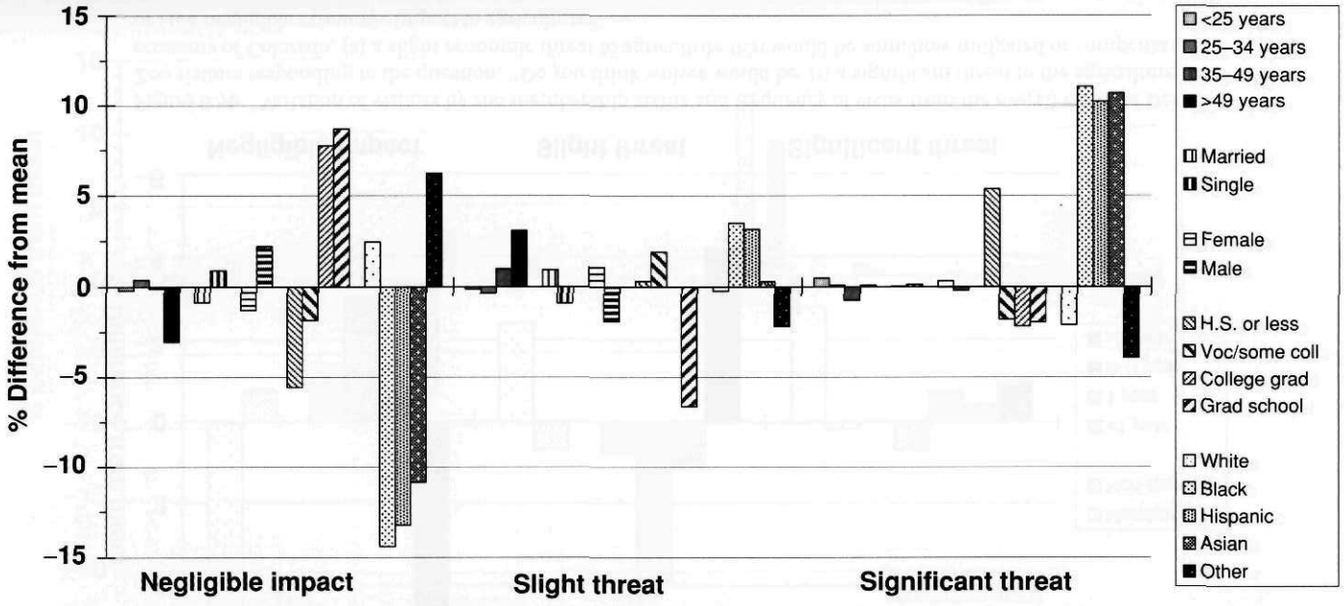

Figure 6.7a Variation of demographic groups from the overall mean of Denver Zoo visitors responding to the question, "Do you think wolves would be; (1) a significant threat to the agriculture economy of Colorado; (2) a slight economic threat to agriculture that would be somehow mitigated or compensated; or (3) a negligible economic impact to agriculture?"

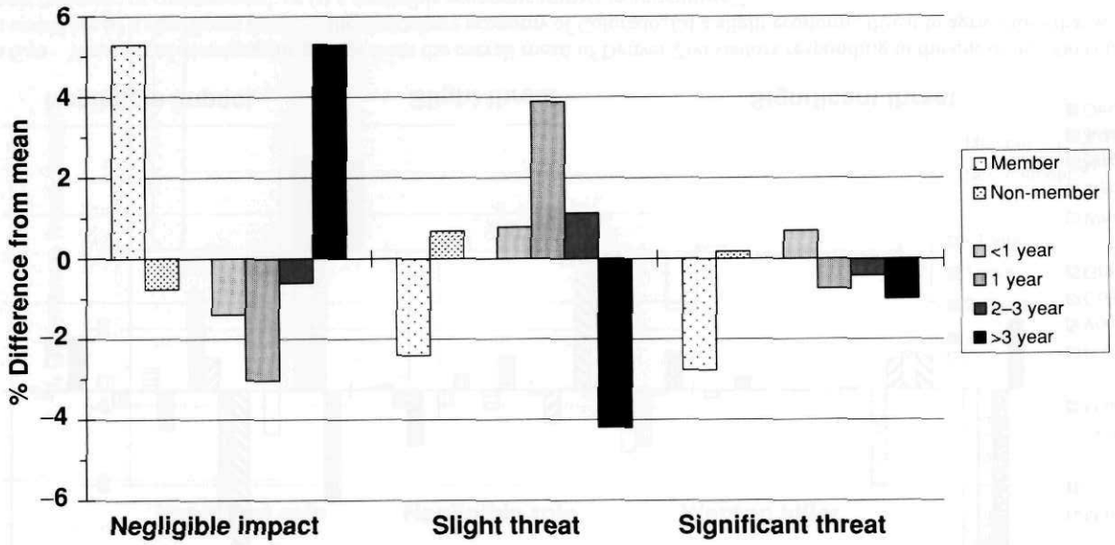

Figure 6.7b Variation of visitors by zoo membership status and frequency of visits from the overall mean of Denver Zoo visitors responding to the question, "Do you think wolves would be: (1) a significant threat to the agriculture economy of Colorado; (2) a slight economic threat to agriculture that would be somehow mitigated or compensated; or (3) a negligible economic impact to agriculture?"

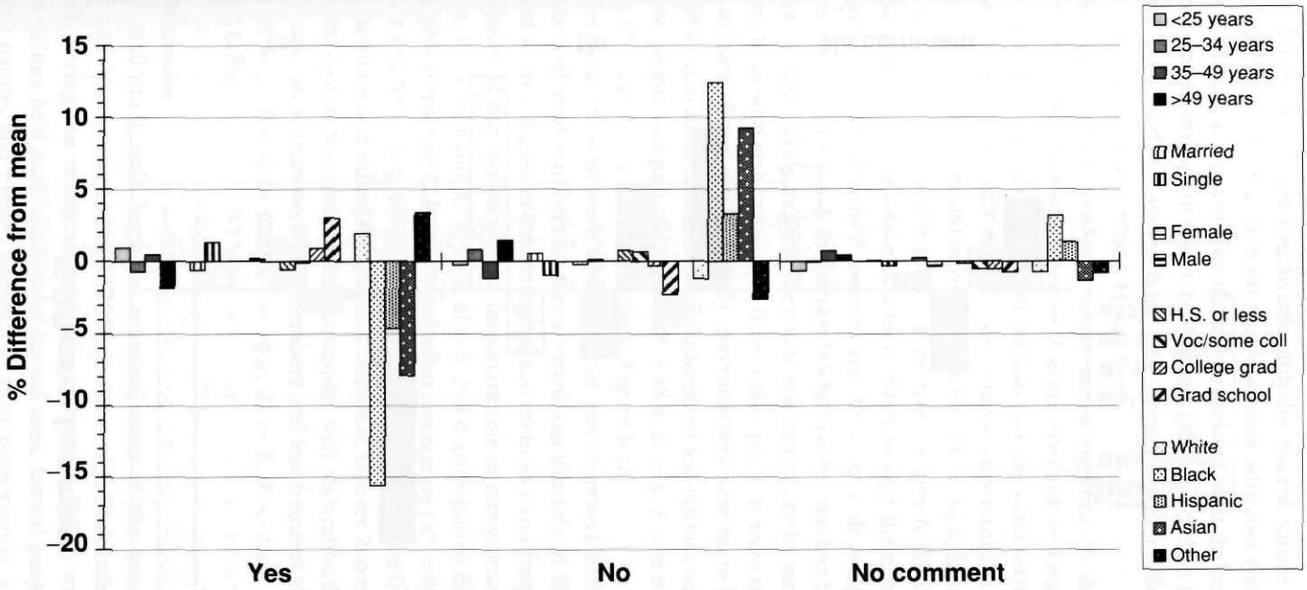

Figure 6.8a Variation of demographic groups from the overall mean of Denver Zoo visitors responding to the question, "Wolves are now establishing a population in the Greater Yellowstone Ecosystem. Would you like to see wolves living in the wilderness areas of Colorado?"

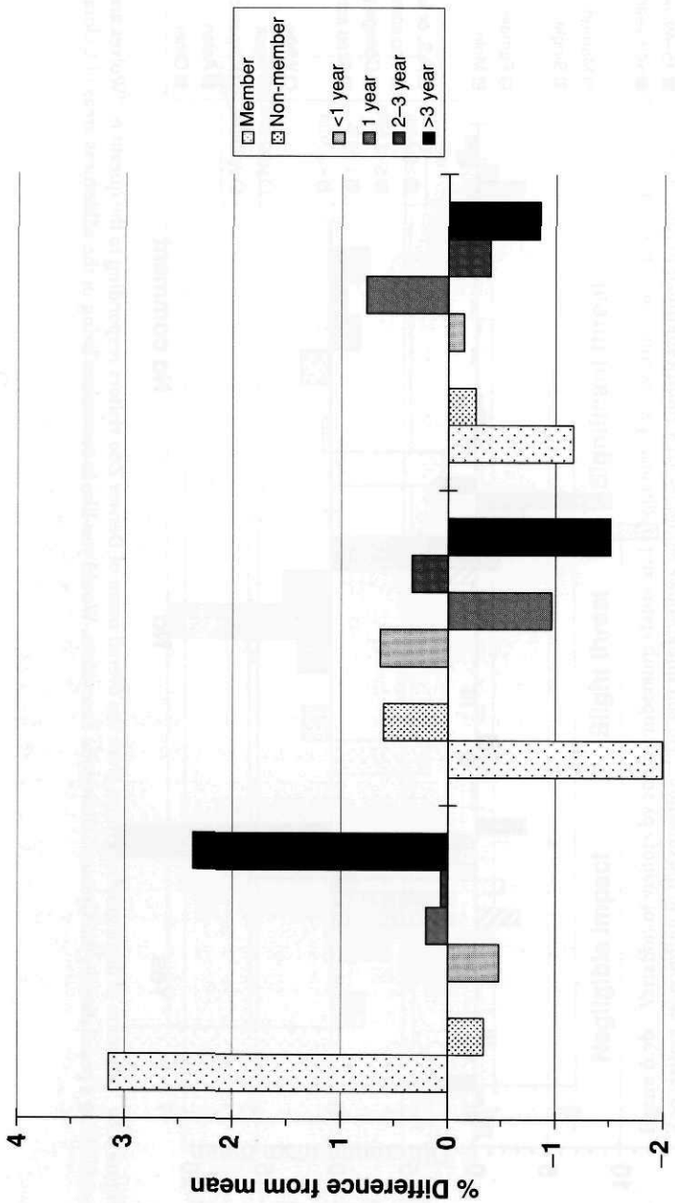

Figure 6.8b Variation of visitors by zoo membership status and frequency of visits from the overall mean of Denver Zoo visitors responding to the question, "Wolves are now establishing a population in the Greater Yellowstone Ecosystem. Would you like to see wolves living in the wilderness areas of Colorado?"

more dominionistic and negativistic attitudes toward nature ($X^2 = 277.5$, df = 15, $P < 0.001$; Figure 6.5a) than did more educated visitors. Greater formal education was also significantly correlated with the beliefs that: (1) wolves play an important role in ecosystems ($X^2 = 61.0$, df = 6, $P < 0.001$; Figure 6.6a) and (2) wolves have little impact on Colorado agriculture ($X^2 = 59.2$, df = 6, $P < 0.001$; Figure 6.7a).

Attitudes toward zoos and nature varied significantly depending on whether a respondent was a Denver Zoo member and on how many times the respondent visited the zoo. Denver Zoo members and respondents who visited the zoo frequently viewed zoos as more important for conservation than did non-members and infrequent visitors ($X^2 = 24.2$, df = 3, $P < 0.001$ and $X^2 = 121.3$, df = 12, $P < 0.001$, respectively; Figure 6.3b). Members and frequent visitors were also much more likely to visit the zoo for a family outing ($X^2 = 51.5$, df = 6, $P < 0.001$ and $X^2 = 157.3$, df = 24, $P < 0.001$, respectively; Figure 6.4b). Respondents who visit the zoo less than once per year were more likely to go to the zoo to see animals or be outdoors, while respondents who visit more than three times per year were more likely to visit to learn (Figure 6.4b). Finally, zoo members were more likely to view people as guardians of nature, while infrequent zoo visitors were less likely to view people as a part of nature ($X^2 = 38.5$, df = 5, $P < 0.001$ and $X^2 = 68.9$, df = 20, $P < 0.001$, respectively; Figure 6.5b).

Respondents who were and were not zoo members and who visited the zoo different numbers of times varied significantly in their attitudes toward wolves. A greater percentage of zoo members and frequent zoo visitors believed that wolves play an important role in ecosystems ($X^2 = 16.5$, df = 2, $P < 0.001$ and $X^2 = 7.48$, df = 8, $P = 0.49$; Figure 6.6b) and pose a negligible impact on Colorado's agricultural economy ($X^2 = 11.0$, df = 2, $P < 0.01$ and $X^2 = 21.9$, df = 8, $P < 0.01$, respectively; Figure 6.7b) than did non-members and infrequent visitors. Similarly, Denver Zoo members and frequent visitors were more likely to support wolf restoration in Colorado's wilderness areas than were non-members and less frequent visitors ($X^2 = 10.3$, df = 2, $P < 0.01$ and $X^2 = 19.4$, df = 8, $P < 0.05$, respectively; Figure 6.8b).

Discussion

Our small study only began to examine many of the important questions and issues surrounding the effectiveness of zoo education programs at influencing the values and attitudes of visitors. While we found that most visitors held positive attitudes toward zoos, toward people's relationship to nature, and toward wolves and their conservation, we could not

determine the extent to which the zoo helped foster these positive attitudes toward nature or whether visitors were predisposed to such attitudes. Additional work is required. A more robust study, for example, would compare values and attitudes of zoo visitors before and after visiting the zoo (see below).

Still, this study and many previous research projects provide baseline data on which to base future studies. And some important insights can be gleaned from this work. For example, people visited the Denver Zoo primarily for family outings and other recreational reasons. Education was less important. Similarly, Kellert (1979) found that people went to zoos to educate children (36%), to recreate with friends and family (26%), to see animals (25%), and for aesthetic reasons (11%). Kellert and Berry (1980) found that people attended zoos more because they felt affection for animals than out of intellectual curiosity. Andereck and Caldwell (1994) found that visitors were oriented primarily toward education/recreation (56.3%), followed by recreation/photography (22.7%), and education (21.0%). Finally, in interviews with children, Kidd *et al.* (1995) reported that most rated zoos as fun (99%), that they learned something (47%), that they preferred unrelated activities (e.g., zoo rides) (13%), or that they were afraid of (2%), disliked (2%) or were indifferent (2%) toward animals. These results highlight the challenge that zoos face in educating visitors that primarily want to be entertained (Morgan and Hodgkinson 1999).

Another result of our study was the difference in attitudes when sorted by ethnic background. Black, Hispanic, Asian, other non-white visitors were generally more utilitarian, dominionistic, and negative toward animals and conservation than were white visitors (although all groups were still strongly supportive of nature). These findings could result from: (1) non-white ethnic groups espousing higher utilitarian, dominionistic, and negative attitudes toward animals and nature, (2) zoos attracting black, Hispanic, Asian, and other non-white visitors with a wider cross-section of viewpoints than white visitors toward animals and nature, (3) zoo education efforts working less effectively on visitors with certain ethnic backgrounds than others, or (4) a combination of these. To reach all visitors better, Kidd *et al.* (1995) suggested developing more ethnically oriented education programs and materials that are bi- or trilingual.

Previous studies of Colorado residents in general found broad and widespread support for wolves and wolf restoration to the state (Manfredo *et al.* 1993, Pate *et al.* 1996, Meadow *et al.* 2005). The higher degree of support for wolves and wolf restoration in Colorado among zoo members and frequent visitors to the Denver Zoo suggests that either the zoo is helping

to foster such attitudes or people with such attitudes are more likely to become zoo members and visit the zoo frequently. Alternatively, since more zoo members than non-members view people as guardians of nature, as opposed to a part of nature, do zoos encourage more dominionistic attitudes or, again, is this a reflection of the types of people that do and do not become members? Only additional research can inform us which of these scenarios, if not all of them, are true.

Future research

Zoos serious about conservation education missions should support research that evaluates the education value of specific zoo programs and the overall zoo experience (Kleiman *et al.* 2000). We recommend combining research with planning using an adaptive management framework (Holling 1978) to continually improve performance. In the true spirit of adaptive management, changes should be based on data. Future studies should attempt to better understand the effectiveness of zoo education programs, graphics, exhibits, and the overall zoo experience in imparting knowledge to visitors and influencing their values, attitudes, and associated behaviors. The limited research conducted to date only begins to address a few of these topics. Other researchers also call for additional studies into zoo education programs. For example, Kidd *et al.* (1995) suggest conducting more long-term studies of the effectiveness of education programs. Hutchins *et al.* (2003) call for extending research into examining the impact of education programs on the welfare of the animals in a collection. Yet, we argue that research should extend much further, especially since increasingly zoos claim to embrace a primary mission of conservation education.

Studies should also examine several other aspects of zoos and educational impact. For example, zoos would likely benefit from studies comparing the efficacy of different types of graphics and of graphics versus other means of imparting information (e.g., docents). In addition, although most people would agree that naturalistic exhibits are better for the animals and for educational efforts, we still have a poor understanding of how exhibits influence human–animal relationships (Marvin 1994). Birney (1995) suggests that changes in exhibit designs are likely to influence the attitude and knowledge of visitors with less education or familiarity with an animal. Studies of different exhibit designs might help us begin to address this gap in our knowledge. We should examine the utility of more targeted education programs to reach all ethnic groups (Kidd *et al.* 1995), urban/inner city (vs. rural or suburban) residents, and people from different wealth and education categories. We also need more research into the desirability and

effectiveness of combining the education and recreation functions of zoos (Heinrich and Birney 1992, Morgan and Hodgkinson 1999).

We further argue that future studies should extend beyond assessing the effectiveness of education programs to impart knowledge to visitors. While providing accurate information is important, we believe this should comprise just one part of a zoo's education goals. Arguably more important is the extent to which zoos can influence visitors' values, attitudes, and associated behaviors. For example, do immersion exhibits decrease the chances that an exhibit experience will lead to dominionistic attitudes toward animals? Related to this, what types of exhibits and what aspects of exhibits engender more positive values and attitudes toward animals and conservation? One way to begin addressing this issue is by comparing attitude change among visitors to different types of exhibits. Despite the lack of data, we believe that most, if not all, zoo education programs remain too diffuse and undirected to induce value, attitude, or associated behavioral changes, which are difficult to accomplish in any case (Chaiken and Stangor 1987, Petty *et al.* 1997). Indeed, the same could be said for educational programs of many NGOs and government agencies. Studies should therefore address the types of education programs and information in those programs that are most persuasive. And since zoos are cultural institutions that likely help shape values and attitudes, and since a dominant value of Western culture society is dominion over nature, zoos should carefully monitor educational messages and their context to maximize the development of less dominionistic and more positive values and attitudes toward animals and wildlife conservation.

Pedagogical literature exists to help guide the development of new zoo education programs, graphics, and exhibit designs, but directed research promises to help us develop more effective programs more rapidly. We recommend conducting both latitudinal (i.e., before and after studies of different people) and longitudinal (i.e., before and after studies of the same individuals) research to assess the effectiveness of (1) education programs, (2) exhibits, and (3) the overall zoo experience. Studies should extend well after zoo visits to assess the degree to which the impacts, if any, created lasting changes to values, attitudes, or behaviors. Ideally, such research would include multiple methods (Clark *et al.* 1999), containing both quantitative (i.e., statistically analyzed data on large numbers of people) and qualitative (i.e., in-depth analyses of few people) studies to increase our confidence in the results.

Finally, it is important to re-emphasize the fact that changing values and attitudes and associated behaviors is often difficult, especially when well developed. As such, zoos should focus on areas that offer the most hope of imparting knowledge and persuasive arguments that will affect change. Most likely this will be among children and visitors with poorly developed values and attitudes toward animals and nature conservation. Reaching out to these segments of society might prove the most fruitful and efficient, not to mention fulfilling. Indeed, the development of strong education programs could help zoos lead the way toward improving programs at other institutions that focus on conservation education.

Acknowledgements

The Denver Zoological Foundation funded this research. Data Marketing Associates, Inc. provided assistance in implementing the survey and inputting the data. Tammy Hill assisted with pre-testing and survey design. Bill Loessberg, Dennis Smith, Brian Klepinger, and Clayton Freiheit facilitated several aspects of this work.

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